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(56) **Contending documentation:**

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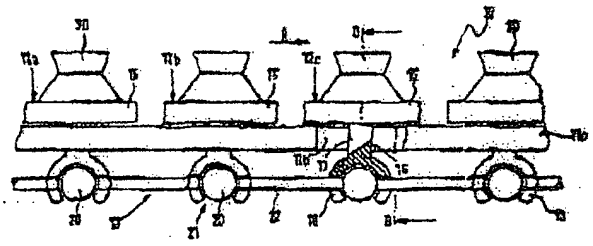
Request for Examination in accord with Pgh. 44 Patent Law has been made

(54) Title: Conveyor

(57) Summary:
Proposed is a conveyor apparatus (10) of at least one beam structure (11) and several carrier elements (12), each independent of one another and having a common drive element consisting of a returning traction means (13).

The said traction means (13) consists of a flexible centrally located cable, onto which grippers (20) are placed. One gripper (20) respectively accompanies one carrier element (12), having a single releasable connection (21), which enables a relative movement between the traction means (13) and the carrier element (12). This permits a turn-around and flexible continuous path of the carrier elements (12) in an installation space of the least possible dimensions.



DE 196 37 624 A1
"Conveyor Apparatus"

Description

The invention concerns a conveyor apparatus in accord with the generic concept of claim 1.

Such conveyor apparatuses are conventionally known under the common term of "chain conveyors". Chain conveyors possess carrier elements, which are bound to an endlessly circulating conveyor chain. Such conveyor chains, however, have a disadvantage, in that they can only make their turnaround and proceed in only one spatial direction. Further these conveyors are relatively expensive to fabricate and give rise to a high noise level during operation.

DE 34 39 260 C2 discloses a conveyor apparatus, on the carrying structures of which a spatially flexible conveyor means circulates. This conveyor means possesses a multiplicity of cross-shaped support elements, the extensions of which serve, among other purposes, for the support and for the lateral guidance of a conveyor band which carries materials being transported. The construction thereof is such that a secure fixation between the carried material and the conveyor band does not exist. On this account, such a conveyor apparatus is adaptable principally for a conveyor band being driven to run in a horizontal plane. With such conveyors, vertical, curving, or overhead movement of transport are difficult to design.

Further, DE 32 35 224 teaches of a conveyor apparatus, which allows a spatial turnaround of its carrying plates. In this case, the carrier plates interconnect with one another with universal jointing. Parts of these universal joints act together, directly with the power pinion of a drive motor, so that this conveyor apparatus requires no separate traction means. The universal binding of the carrier plates has the disadvantage, that the linkages are relatively complicated and expensive. The direct drive of the carrier plates demands, in a case of wear, a complete replacement. Finally a multi-directional freedom of motion of the carrier plates, because of the universal jointing is relatively limited. This permits only turnaround motions with relatively large radii of curvature.

Advantages of the Invention

The invented conveyor apparatus, in contrast to the above, has the advantage, that its carrier elements have freedom to move spatially in all directions, which includes pivotal motion and tilting (i.e. vertical motion). These motions demand only the minimum radii of curvature, because the individual carrier elements can move independently of one another in reference to the means of traction and for this purpose, the said carrier elements can be optimized in their load bearing contours.

The drive of the carrier elements is done by a traction means, which possesses, for each carrier element, a snap-on connection. These provide fixed connections between the traction means and the carrier elements, without simultaneously limiting the relative motion between the components. For maintenance and repair work, the said snap connections are releasable at all locations.

For this operation no special tooling is required, or, at least only the most simple tools can be used. The traction device is easily and economical fabricated and is not a source of any appreciable noise-level.

The Drawing

One embodiment of the invention is presented in the drawing and is explained in the following description.

Fig. 1 shows schematically a section of an invented conveyor apparatus in profile view,

Fig. 2 shows a transverse section through line I-I of Fig. 1, and

Figs 3 and 4 show two embodiment variants of conveyor carrier elements in top view.

Description of the Embodiment Example

The conveyor apparatus which is shown in Figs. 1 and 2 consists of two oppositely placed support members 11a, 11b, a multiplicity of driven carrier elements 12a, 12b, and 12c and a continuous traction means 13 which forms the drive for the said carrier elements 12a, 12b and 12c. The support members 11a, 11b run parallel to one another and allow a limited space 14 between their respective bordering sides. The carrier elements 12a, 12b, and 12c, possess, respectively, upon the upper side of each, a carrying plate 15, upon which workpieces 30 of various kinds can be placed. With their lateral edge zones, the carrier elements 12a, 12b, and 12c rest upon the two support members 11a, 11b. The drive and the guidance of the carrier elements 12a, 12b, and 12c is effected by means of a rigid foot 16, which is affixed respectively on the underside of each of the said carrier elements. This connecting foot extends itself into the said space 14 between the support members 11a, 11b. The connecting foot 16 merges itself into a shaft 17 and connects to a ball cup 18. The length and the outside dimensioning of the shaft 17 are determined by the thickness of the support members 11a, 11b as well as being in accord with the width of the space 14 between these said members. The ball cup 18 possesses a slot 19 running in the direction of the transport motion. This slot 18 extends itself up to a plane which runs symmetrically parallel to the movement of transport of the ball cup 18. By means of this ball cup 18, each carrier element 12a, 12b, and 12c forms a single fixation 21 with the continuous traction means 13. The fixation 21 permits, in any case, a relative movement between the carrier element 12a, 12b, and 12c and the continuous traction means 13. The said continuous traction means 13, which runs longitudinally underneath the support members 11a, 11b is equipped with a spherically shaped gripper 20. This said gripper consists of a low friction, wear-resistant plastic and connectively snaps into the ball cup 18. The fixation means 21 allows itself to be released at any time. The grippers 20 of the traction means 13 are linked together by a flexible, central cord 22, upon which the said successive grippers are mutually, concentrically bound by injection molding. The central cord 22 preferably consists of a steel cable. The outer circumference of the said central cord 22 is enclosed by a fabric covering 24.

The traction means 13 runs in an endless turnaround path, powered by a (not shown) drive sheave which is rotated by a drive motor. The said sheave possesses a circumferential groove, into which groove a multiplicity of spherical indentations matching the ball shape of the gripper 20 are formed. This arrangement permits a complete turnaround motion in the path of the traction means 13. The fixation 21 between the traction means 13 and the carrying element 12a, 12b, and 12c establishes the basis for conveying transport. The said fixation 21, which is designed as a snap-in connection, makes possible the spatial tilting and pivotal movement of the carrying elements. These spatial movements, along with the design of the carrying plates 15 allow turnarounds about relatively small radii of curvature.

Fig. 3 shows, in this respect, a modification of a plurality of interlocked, flat carrier plates 15a, 15b, 15c and 15d in a plan view. These interlocked carrier plates 15a, 15b, 15c and 15d are individually designed to be in a somewhat scale shaped in form and possess at their forward edge, relative to the direction of transport R, a circular shaped extension 25 and at their trailing edge a complementary circular shaped recess 26. Neighboring carrying plates 15a, 15b, 15c thus connect themselves compactly to one another and form thereby a continuous carrying platform. From Fig. 3, may also be inferred, how the individual carrying plates 15a, 15b, 15c move in relation to one another in a turning situation, and avoid the danger that a larger opening can form between them. The turning shown, which is exemplary in being of one direction, is carried out in this case in the plane of the transport direction. The fixation 21 would especially also permit a change of course directed, so to speak, out of the drawing plane, that is to say also into the plane of the drawing.

In Fig. 4 a second variation of carrying plates 15d, 15e, and 15f shows the plates being circular and touching each other practically without an opening. The circular form permits, especially in cases of very large area carrying plates, a turn of the same up to about 180° in a space saving manner. The smallest possible radius of curvature for such a turnaround of a series of carrier plates is dependent upon the diameter of the carrier plates 15d, 15e, and 15f.

Obviously, changes or developments are possible without departing from the concept of the invention. In this matter, mention should be made, that instead of the support members 11a, 11b, as these are shown in the embodiment, it is possible that also spatially designed support members can be installed, which, at least have on their outer sides a back-cut groove with a sufficiently sized recess opening to the outside.

Likewise worthy of consideration, is that the conveyor apparatus 10 can possess only one support member 11 for the guidance and the support of the carrier element 12a, 12b, and 12c.

Further, it is possible that the described ball cup 18 at the bearing foot 16 can have a design which calls for a single construction at least three bowlike curved radial webs.

CLAIMS

Claimed is:

1. A conveyor apparatus, especially for the transport of workpieces (30) in a fabrication line, with at least one longitudinal support member (11) along which a plurality of carrier elements (12), which are driven by at least one traction means (13) and which, for their guidance, that is to say, for their support lie at least partially on the said support member (11) and which, in the assembled state, carry out an endless turnaround motion, therein characterized, in that each carrier element (12) possesses for the said spatial pivotal and tilting turnaround movement a single means of fixation (21) with the traction means (13).

2. A conveyor apparatus, in accord with claim 1, therein characterized, in that the plurality of means of fixation (21) between the carrying element (12) and the traction means (13) are releasable snap-in connections which are formed from the grippers (20), which are fastened to the traction means (13) and from the bearing feet (16) which are constructed on the said carrier elements (12), which are attached to the said grippers (20).

3. A conveyor apparatus in accord with claim 2, therein characterized, in that the traction means (13) consists of a flexible, central cord (22) on which the grippers (20) are placed in apportioned succession.

4. A conveyor apparatus in accord with claim 2 or 3, therein characterized, in that the grippers (20) are composed of plastic, are designed to be spherical and encapsulate the central cord (22) on all sides.

5. A conveyor apparatus in accord with one of the claims 3 to 4, therein characterized, in that the central cord (22) of the traction means (13) consists of a steel cable.

6. A conveyor apparatus in accord with one of the claims 3 to 5, therein characterized, in that the said steel cable of the traction means (13) is circumferentially encased in a covering.

7. A conveyor apparatus in accord with one of the claims 1 to 6, therein characterized, in that the carrier elements (12) border on one another and respectively exhibit a scale-like carrier plate (15).

8. A conveyor apparatus in accord with one of the claims 1 to 6, therein characterized, in that the carrier elements (12) border on one another and exhibit a circular carrier plate (15).

9. A conveyor apparatus in accord with one of the claims 1 to 8, therein characterized, in that the carrier elements (12) are designed to be separate components independent of one another.

[To the foregoing are to be found two pages of drawings]

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Fig. 1

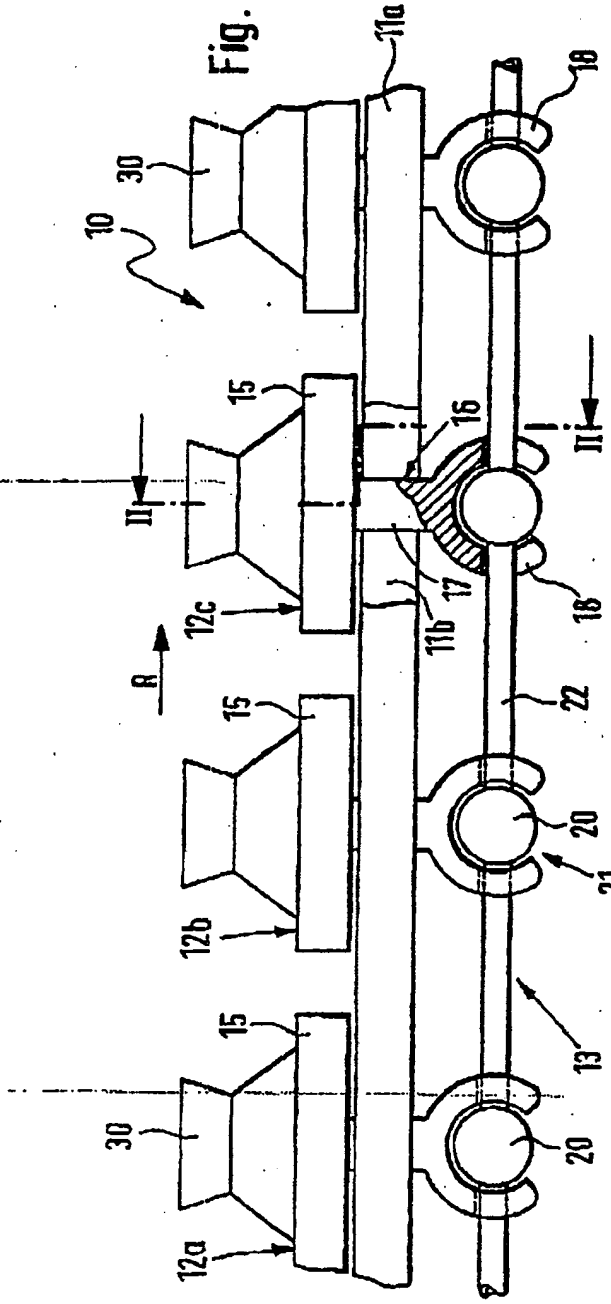
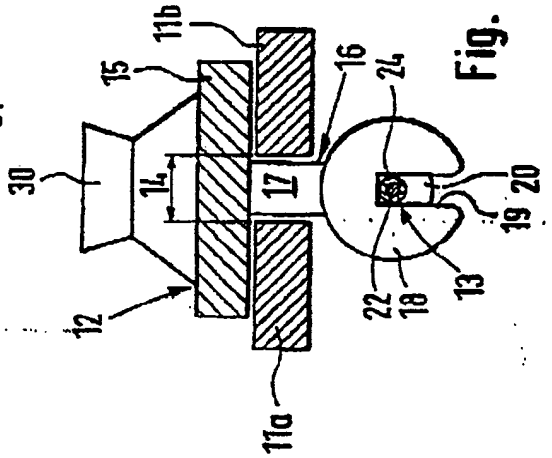


Fig. 2



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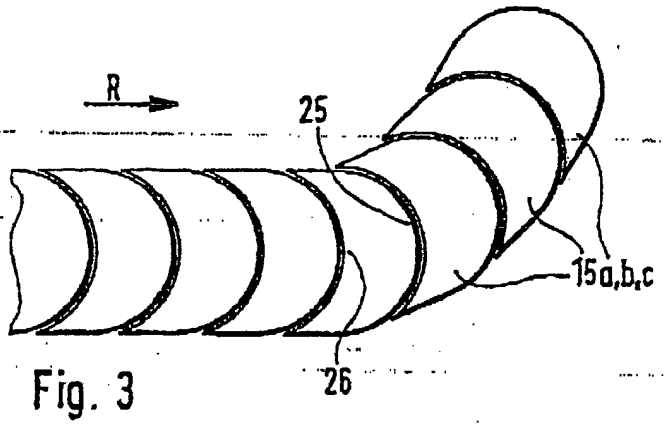

Fig. 3

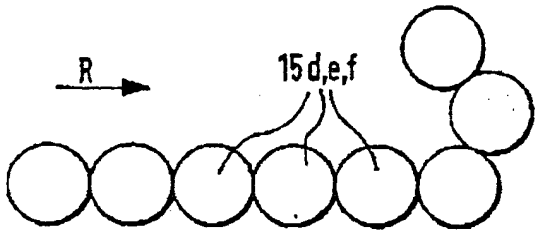

Fig. 4